Biomimetic principles in sustainable architecture design, using natural materials as straw, clay and mycelium

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Abstract:

Answers to various design problems have been searched in our natural environment since ancient times and on different levels – principles, mechanisms, adaptation processes, etc. Thus, also the “green” and “eco” movements for architectural sustainability have been gradually developed, elaborating the ideas with the use of biomimetic principles.

In this context such design principles are proposed by Michael Pawlyn (demanding higher resource efficiency, closed loop model of using resources) and Ken Yeang (in the concepts of eco-architecture – “alive” as a “living system” (organism), “analogue to a constructed ecosystem”). They suggest that buildings (or urban habitats) could be examined as ecosystems in which animate and inanimate elements interact together. Thus, symbiotic relations could be found or even designed within the integration of “synthetic” and “natural” building parts.

Current tendencies for using natural, environmentally-friendly, materials could also be viewed upon as a part of the implementation of the mentioned bionic principles, aiming the demand for lowering the production of waste materials, the resource and energy use, as well as more adequate relation and behaviour of the architecture to the surrounding environment and conditions. The application of those materials is inspired both from traditional building techniques and from biomimetic ideas.

The paper will investigate the relations between natural materials such as **straw, clay and mycelium** and the building “organism”: the resulting effects on state, behaviour and characteristics of architectural spaces and elements, regarding aspects like health conditions, psychological effects, construction quality, social and environmental impact, etc. The symbiotic connections between materials themselves, as well as between design and the used natural media are also to be examined specifically from regional perspective. The objects of analysis will be mainly contemporary and experimental building methods.

The expected results are in the field of the contemporary architecture theory.